



US006346328B1

(12) **United States Patent**
Parsonage et al.

(10) Patent No.: **US 6,346,328 B1**
 (45) Date of Patent: **Feb. 12, 2002**

(54) **COMPOSITE ARTICLES INCLUDING A
 FLUOROPOLYMER**

(75) Inventors: **Edward E. Parsonage, St. Paul; Attila
 A. Molnar, Vadnais Heights; Thomas
 J. Blong, Woodbury; Robert E. Kolb,
 Afion, all of MN (US)**

(73) Assignee: **Dyneon LLC, Oakdale, MN (US)**

(*) Notice: Subject to any disclaimer, the term of this
 patent is extended or adjusted under 35
 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/329,686**

(22) Filed: **Jun. 10, 1999**

Related U.S. Application Data

(60) Provisional application No. 60/094,668, filed on Jul. 30,
 1998.

(51) Int. Cl.⁷ **B32B 25/08; B32B 27/08;
 B32B 27/30; B32B 27/34; B32B 27/36**

(52) U.S. Cl. **428/412; 428/421; 428/422;
 428/424.2; 428/424.4; 428/424.6; 428/474.7;
 428/474.9; 428/475.8; 428/476.1; 428/476.3;
 428/483; 428/515; 428/516; 428/520; 428/522;
 428/523**

(58) Field of Search **138/124, 125,
 138/126, 137, 140, 145, 146, DIG. 3; 428/421,
 412, 422, 474.9, 475.5, 475.8, 476.3, 483,
 424.2, 424.4, 424.6, 575, 520, 522, 424.7,
 516, 523**

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,655,727 A	4/1972	Patel et al.	260/470 P
3,686,143 A	8/1972	Bowman	260/47 UP
3,712,877 A	1/1973	Patel et al.	260/87.7
3,857,807 A	12/1974	Kometani et al.	260/29.6 F
3,876,654 A	4/1975	Pattison	260/30.4 R
3,933,732 A	1/1976	Schmiegel	260/42.27
4,233,421 A	11/1980	Worm	525/343
4,259,463 A	3/1981	Moggi et al.	525/331
4,335,238 A	6/1982	Moore et al.	526/254
4,501,858 A	2/1985	Moggi	525/340
4,673,715 A	6/1987	Caywood	525/340
4,748,208 A	5/1988	Kasahara et al.	525/151
4,833,212 A	5/1989	Yamada et al.	525/359.2
4,882,390 A	11/1989	Grootaert et al.	525/326.3

4,933,090 A	6/1990	Gill et al.	210/700
5,319,025 A	6/1994	Weigelt	
5,383,087 A	1/1995	Noone et al.	
5,399,434 A	3/1995	Katz et al.	428/421
5,552,199 A	9/1996	Blong et al.	428/36.9
5,566,720 A	10/1996	Cheney et al.	
5,658,670 A	8/1997	Fukushi et al.	428/421
5,792,532 A	8/1998	Pfleger	
5,804,670 A	9/1998	Stoeppelmann	
6,096,428 A	8/2000	Jing et al.	428/421
6,156,400 A	12/2000	Jing et al.	428/35.7

FOREIGN PATENT DOCUMENTS

EP	0 739 712 A2	10/1996
WO	WO 93/01493	1/1993
WO	WO 93/14933	8/1993
WO	WO 99/00249	1/1999
WO	WO 99/32557	7/1999

OTHER PUBLICATIONS

F. W. Billmeyer, *Textbook of Polymer Science*, 3rd ed., pp.
 398-403, John Wiley & Sons, New York (1984).

R. A. Brullo, "Fluoroelastomer Rubber for Automotive
 Applications", *Automotive Elastomer & Design*, Jun. 1985.

R. A. Brullo, "Fluoroelastomer Seal Up Automotive
 Future", *Materials Engineering*, Oct., 1988.

W. M. Grootaert et al., "Fluorocarbon Elastomers",
 Kirk-Othmer, *Encyclopedia of Chemical Technology*, vol. 8,
 pp. 990-1005 (4th ed., John Wiley & Sons, 1993).

"Organic Fluorine Compounds", Kirk-Othmer, *Encyclope-
 dia of Chemical Technology*, vol. 11, pp. 20, 21, 32, 33, 40,
 41, 50, 52, 62, 70, 71 (John Wiley & Sons, 1980).

West, A.C. & Holcomb, A.G. "Fluorinated Elastomers",
 Kirk-Othmer, *Encyclopedia of Chemical Technology*, vol. 8,
 3rd ed., John Wiley & Sons, Inc., pp. 500-515 (1979).

Primary Examiner—Vivian Chen

(74) Attorney, Agent, or Firm—James V. Lilly; Dean M.
 Harts

(57) **ABSTRACT**

A composite article is provided which includes a fluoropoly-
 mer intimately bonded to a component including a substan-
 tially non-fluorinated thermoplastic having pendant phenolic
 groups in combination with a base. Increased adhesion is
 observed by a greater peel strength value between the
 fluoropolymer component and a non-fluorinated thermoplas-
 tic having pendant phenolic groups.

48 Claims, No Drawings